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Diagnostika ICHS od mýtů k medicíně založené na důkazech

Tomáš Kovárník



II. interní klinika
kardiologie a angiologie
VFN a 1. LF UK
Praha



První známá zobrazení srdce



Jeskyně Pindal, Španělsko, 15-30 000 let

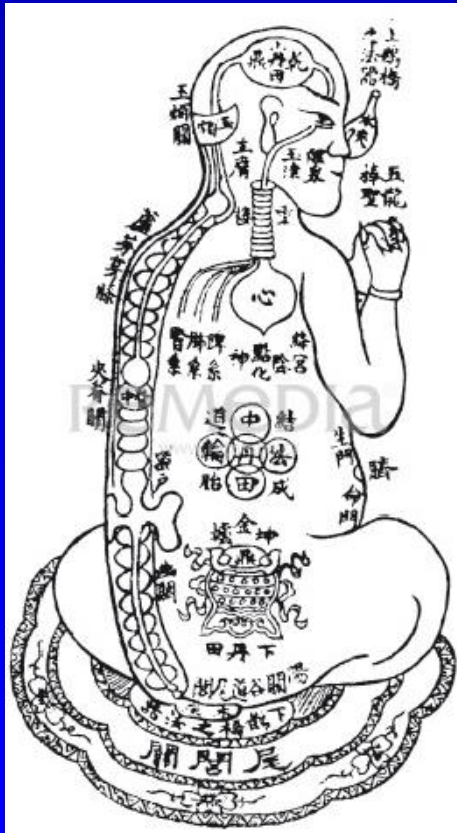
Olmékové, Mexico, snad 1 000 př.n.l.



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J. Hořejší Remedia 2015, M. Riedel Historie
kardiologie 2009

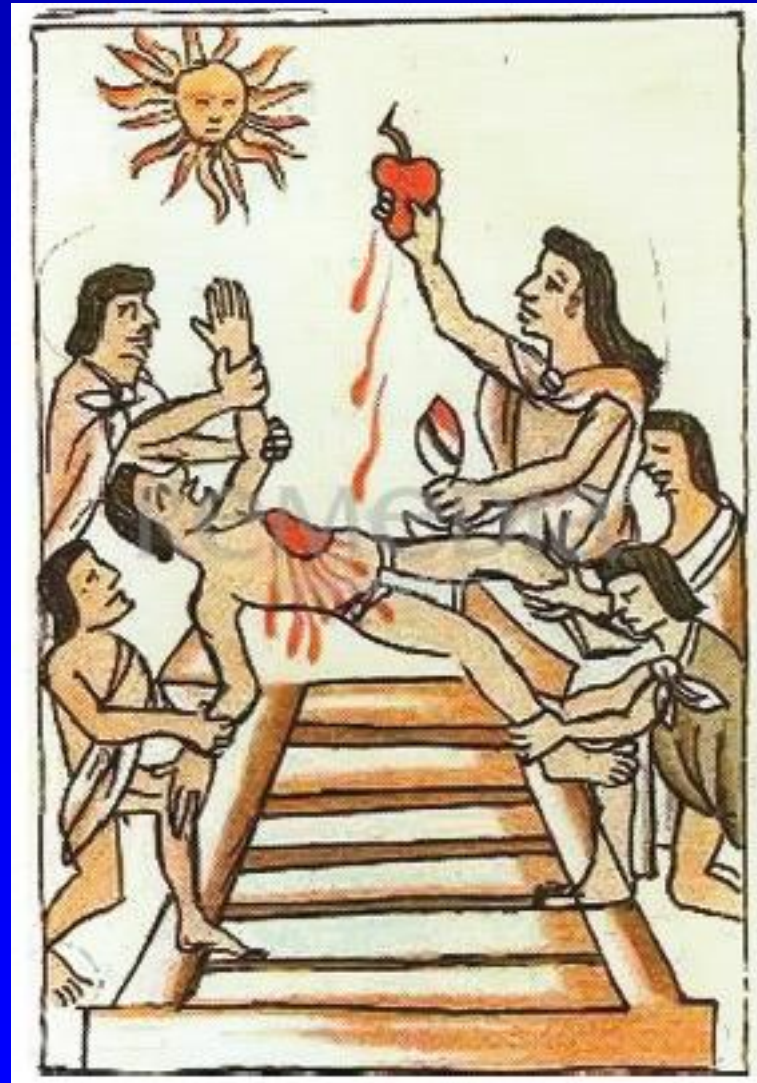
Čína a Egypt



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J. Hořejší Remedia 2015, M. Riedel Historie kardiologie
2009

Azetékové (Mexico)



J. Hořejší Remedia 2015, M. Riedel Historie kardiologie
2009



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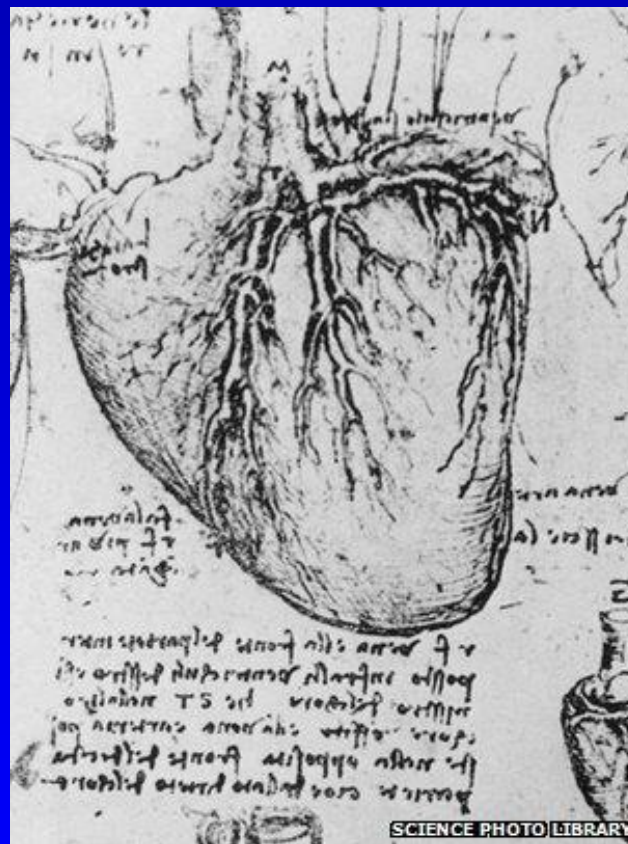
Kameny z Ica (Peru) neznámý původ a stáří



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Česká televize

Leonardo da Vinci (1452-1519)



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Symbol srdce v dnešní době

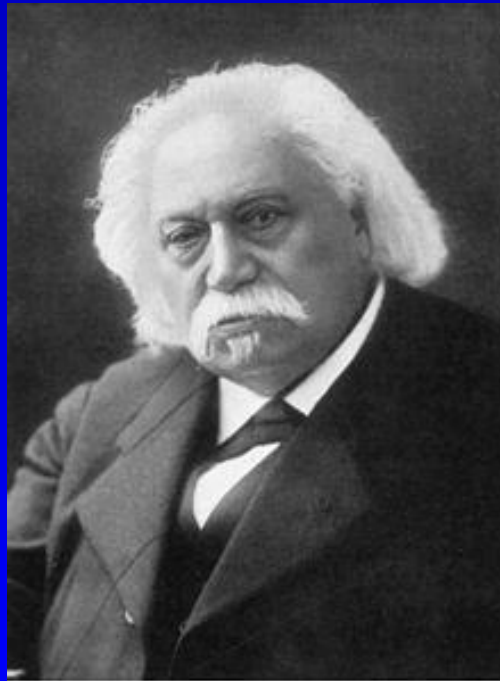


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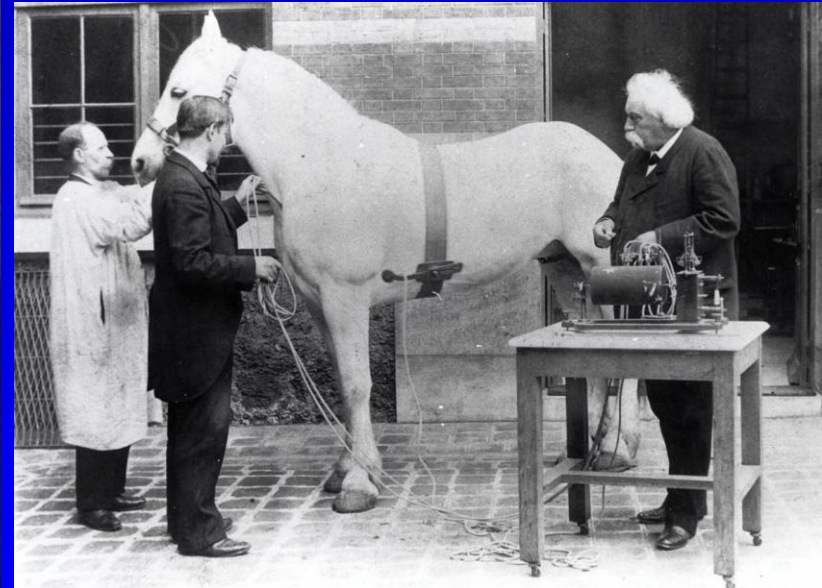
První měření intrakardiálních tlaků



Claude Bernard 1831-1878

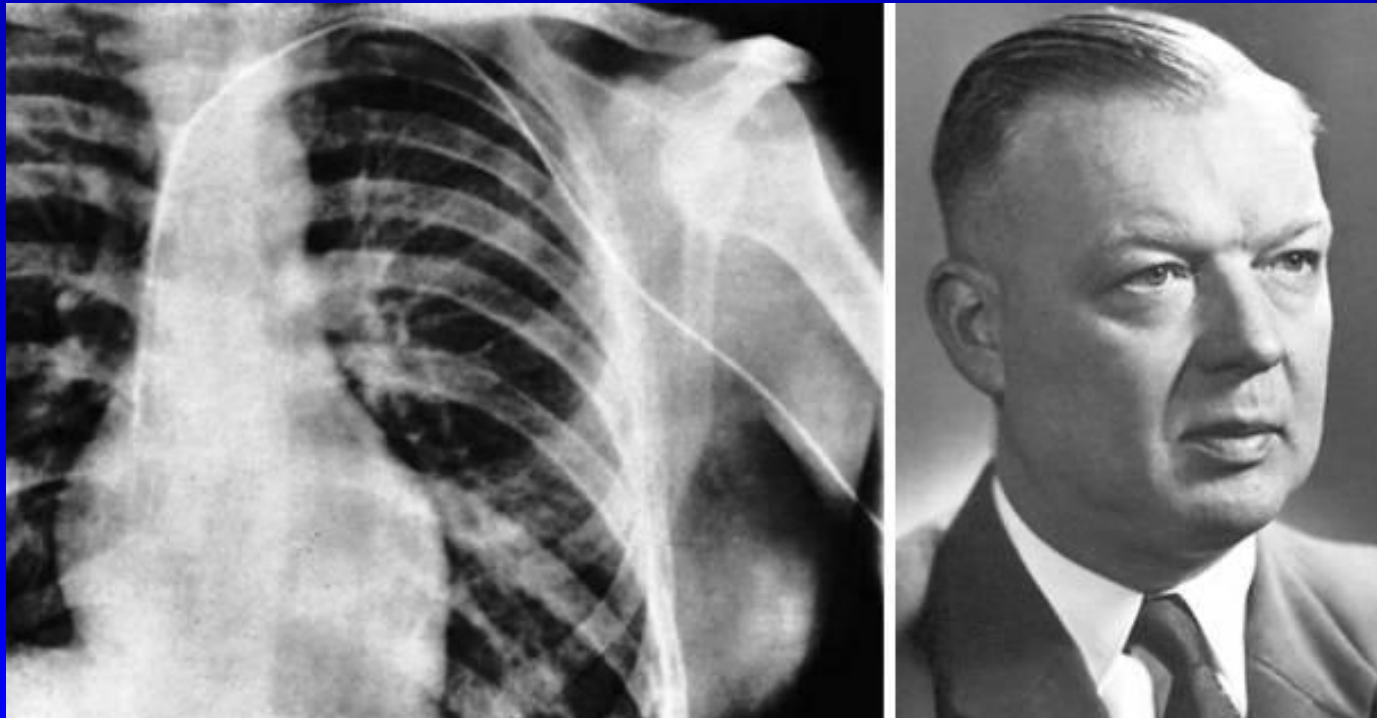


Auguste Chauveau 1827-1917



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První katetrizace živého člověka, 1929



Werner Forssmann 1904-1979



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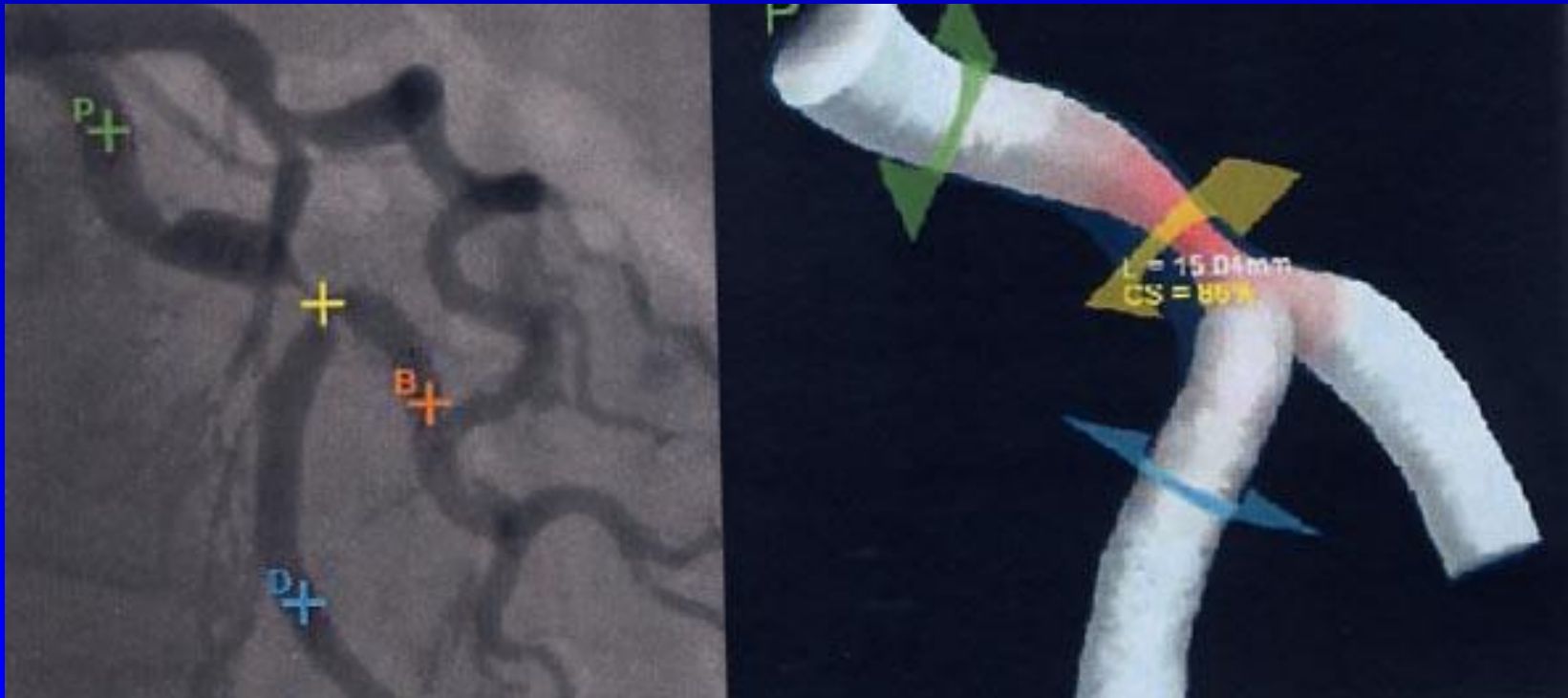
První selektivní koronarografie 1958, dr. Mason Sones Jr., Cleveland Clinic



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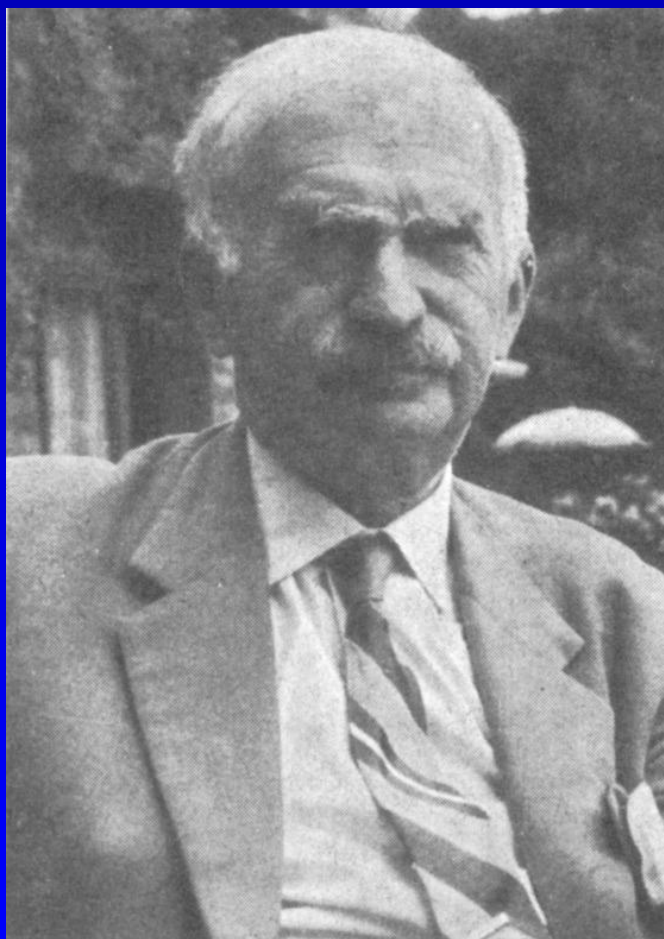
Cheng T. Circulation 2003;107:e42

Moderní SKG



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První invazivní měření srdečního výdeje - 1930



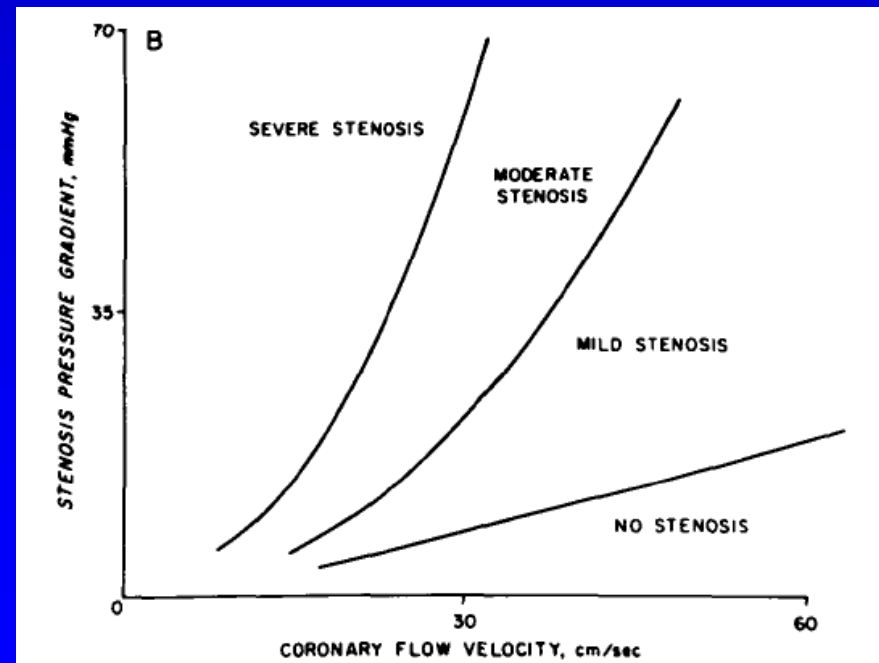
Otto Klein 1891-1968



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Physiological Significance of Coronary Flow Velocity and Changing Stenosis Geometry during Coronary Vasodilation in Awake Dogs

K. Lance Gould and Katherine O. Kelley
From the University of Texas Medical School at Houston, Texas



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EXPERIMENTAL STUDIES

Coronary Flow Reserve as a Physiologic Measure of Stenosis Severity

K. LANCE GOULD, MD, FACC, RICHARD L. KIRKKEIDE, PhD, MARTIN BUCHI, MD

Houston, Texas

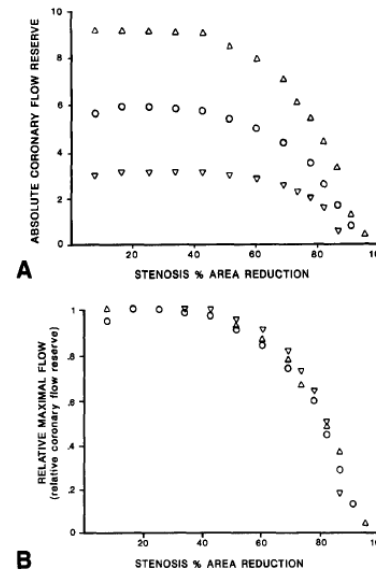


Figure 3. A, Changes in coronary flow reserve during phenylephrine and nitroprusside infusion during progressive coronary artery stenosis in one experiment. Absolute coronary flow reserve is plotted on the vertical axis, defined as maximal flow divided by coronary flow at rest measured by flow meter. Percent area stenosis is plotted on the horizontal axis, measured by the arterial constrictor and confirmed by arteriography, with length and normal diameter remaining constant. Absolute coronary flow reserve showed marked variation for any given fixed stenosis depending on aortic pressure. B, Relative maximal coronary flow or relative flow reserve, defined as maximal flow in the stenotic artery divided (normalized) by normal maximal flow in the absence of the stenosis, showed little variation over a wide range of stenosis severity during progressive stenosis with phenylephrine; inverted

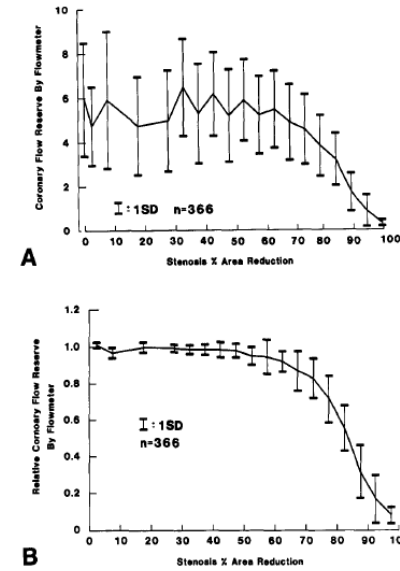


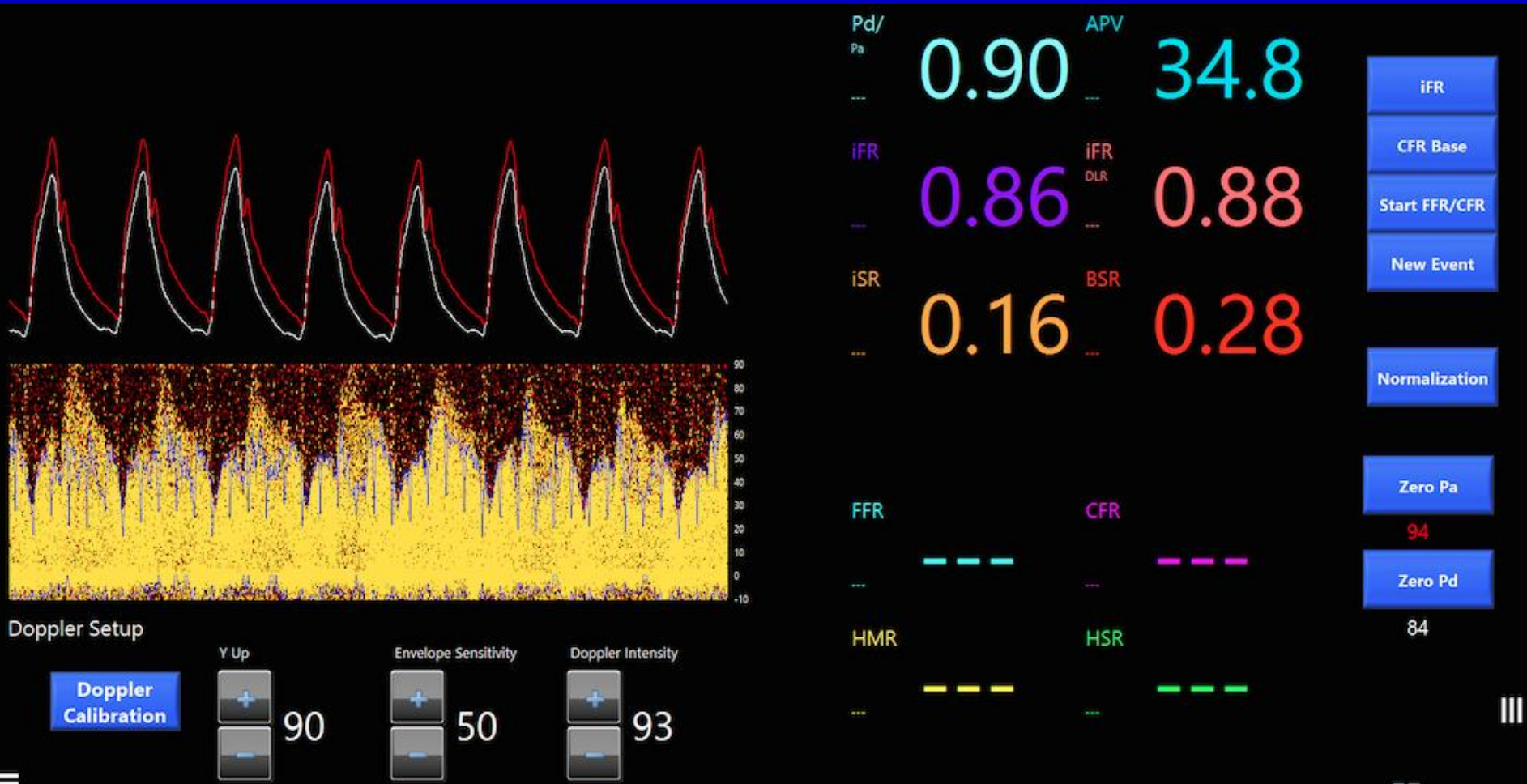
Figure 4. A, Absolute coronary flow reserve (maximal flow divided by flow at rest) for all 366 experiments over the full range of changes in aortic pressure and stenosis severity. B, Relative maximal coronary flow or relative flow reserve (maximal flow in stenotic artery divided by normal maximal flow in absence of stenosis) for all 366 experiments over the range of changes in aortic pressure with progressive coronary artery stenosis.

depending on aortic pressure and heart rate. However, relative maximal flow or relative flow reserve was independent of aortic pressure and heart rate (Figure 3B). Relative flow reserve was approximately 0.90 for the 65% stenosis condition. For all stenoses with 65% area narrowing, absolute

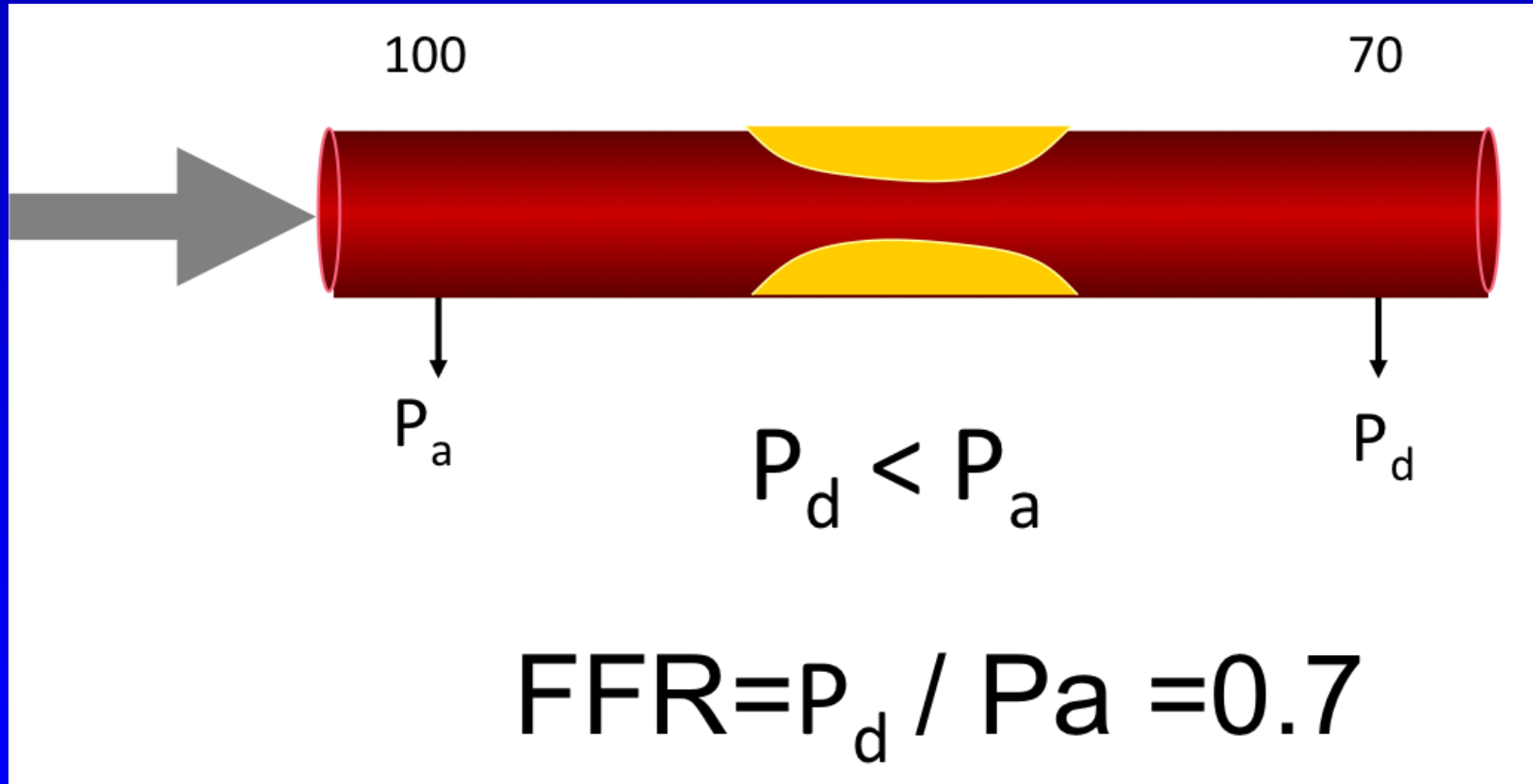


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Funkční metody CFR, FFR (iFR)



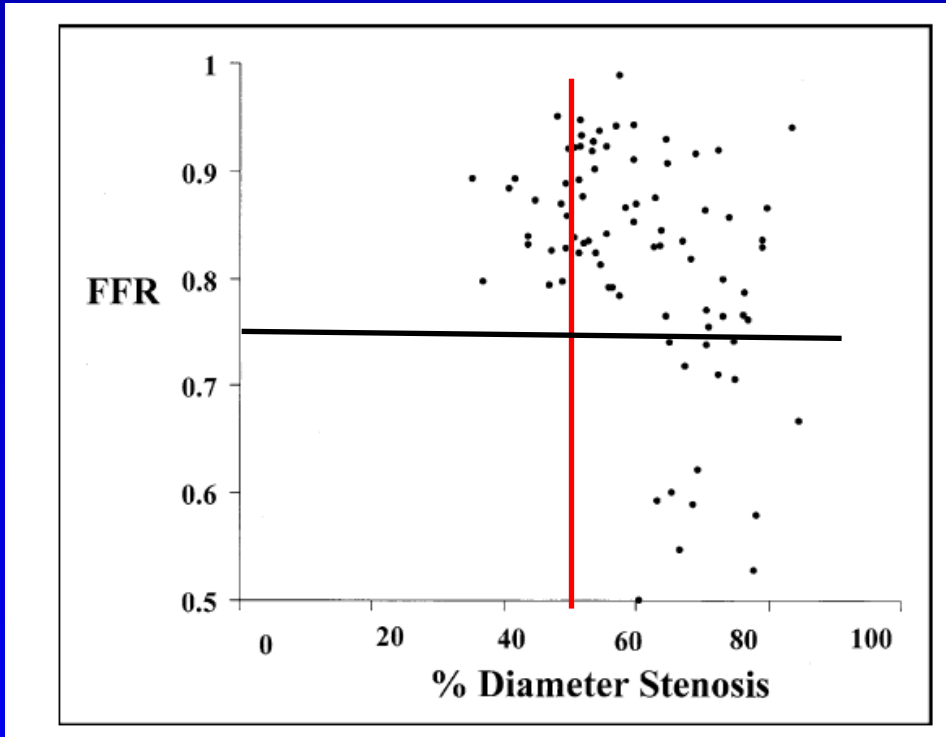
Frakční průtoková rezerva - FFR



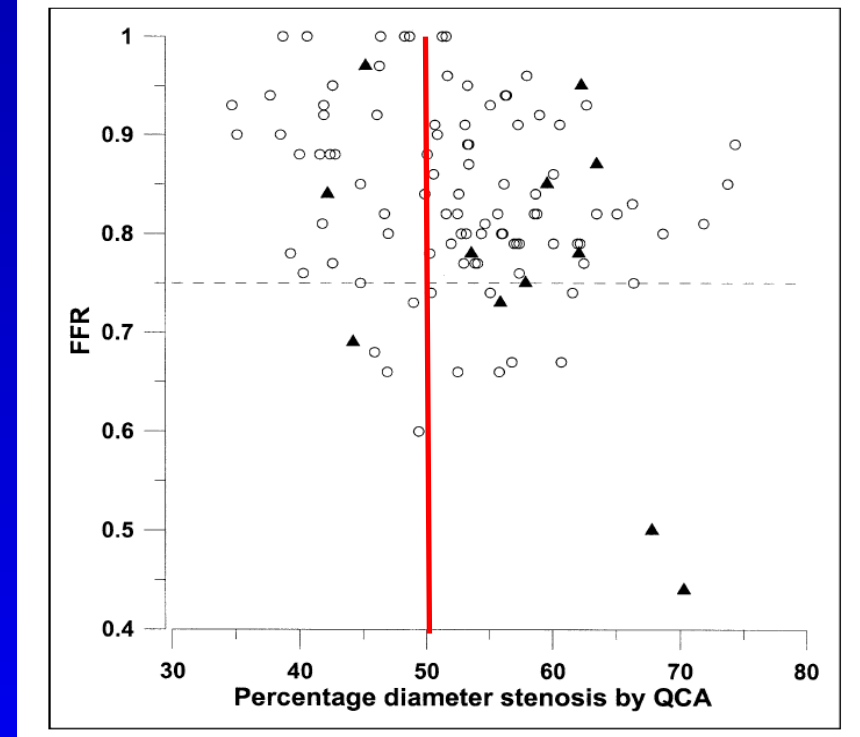
$Q = P/R$,
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pokud je R minimální platí, že $Q \cong P$





Fisher JJ, Am J Cardiol 2002;90:210-215



Chamuleau. Am J Cardiol 2002;89:377-380

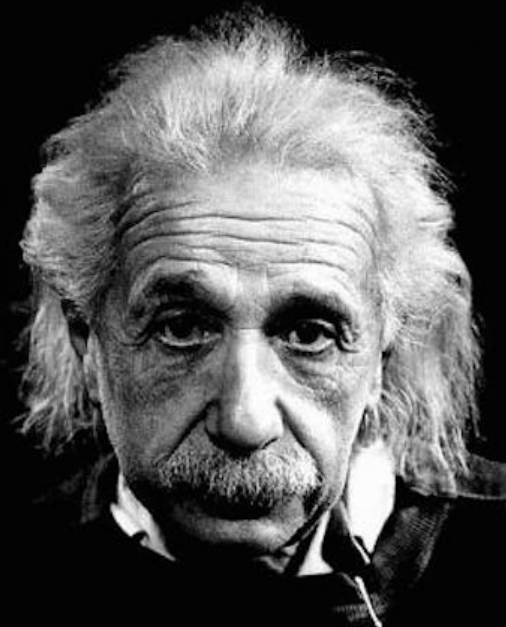


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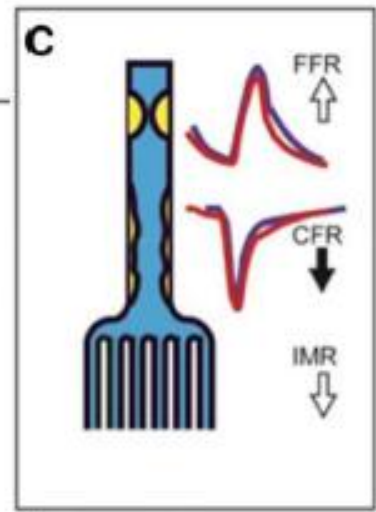
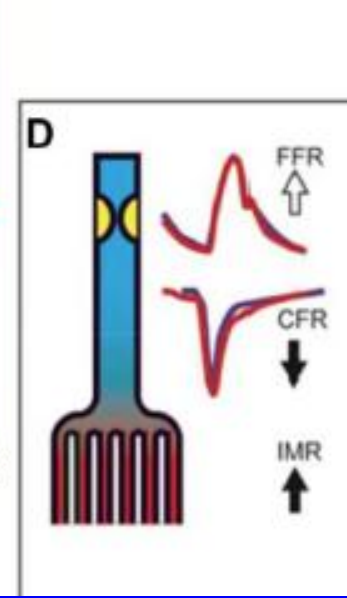
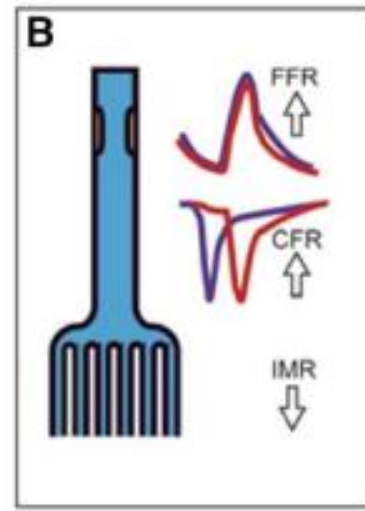
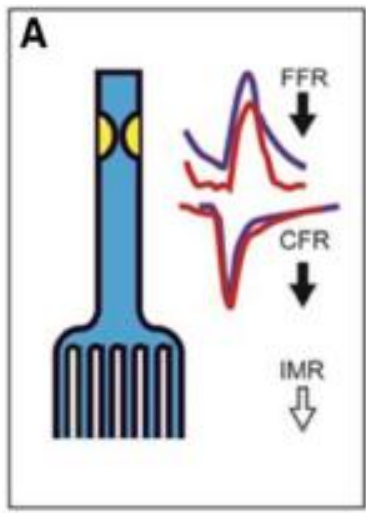
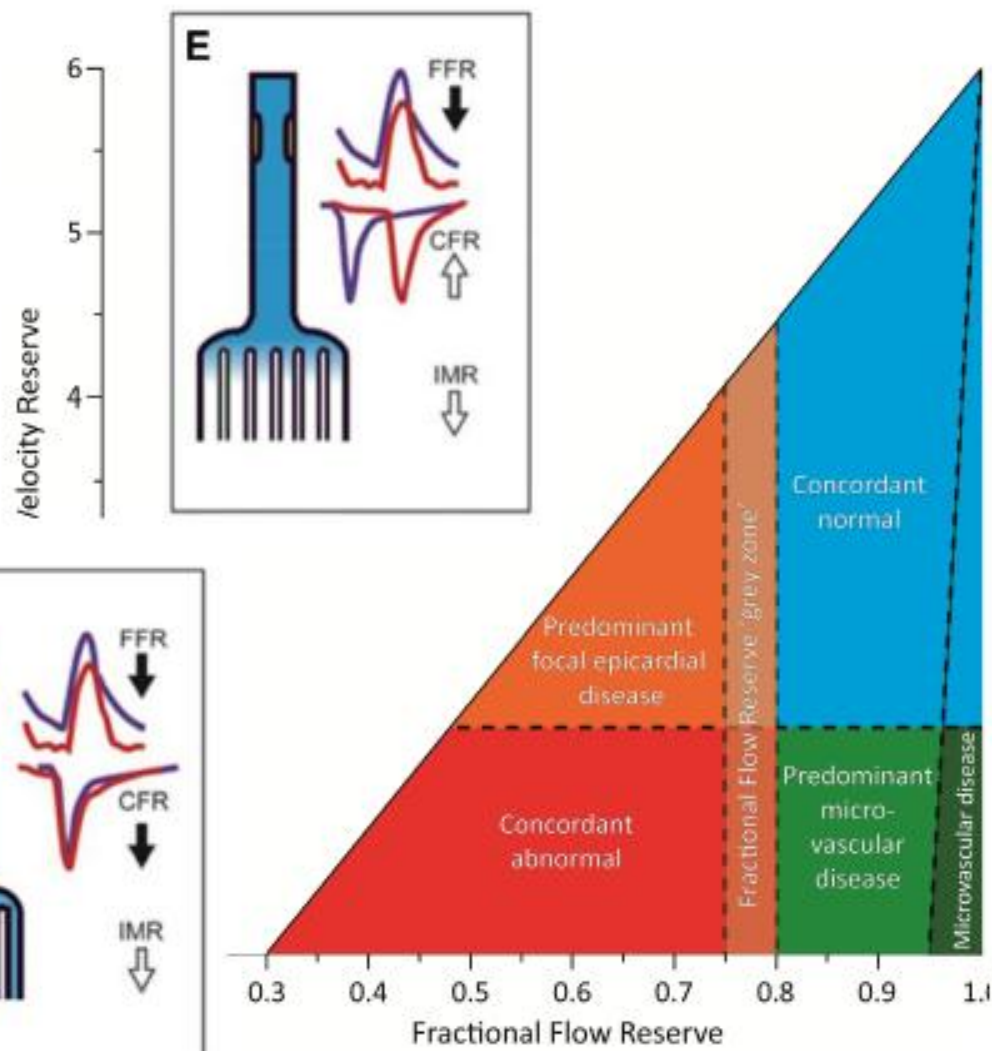
Funkční vyšetření koronárních tepen

“Everything should be made
as simple as possible,
but not simpler.”

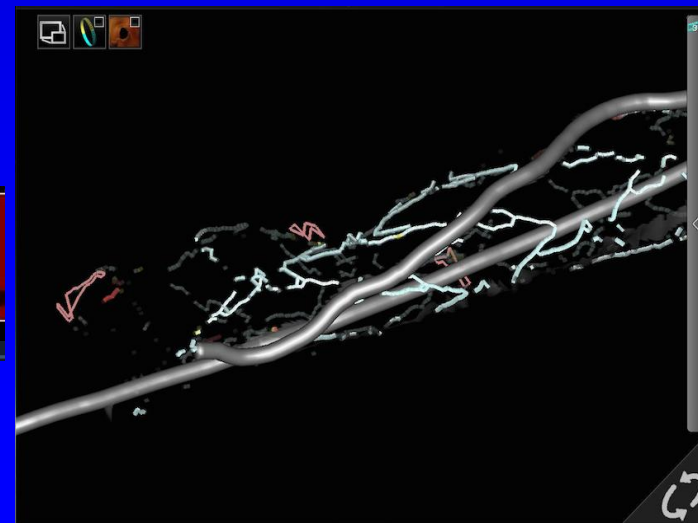
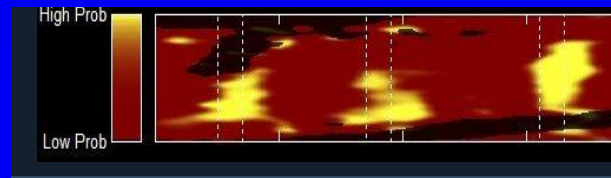
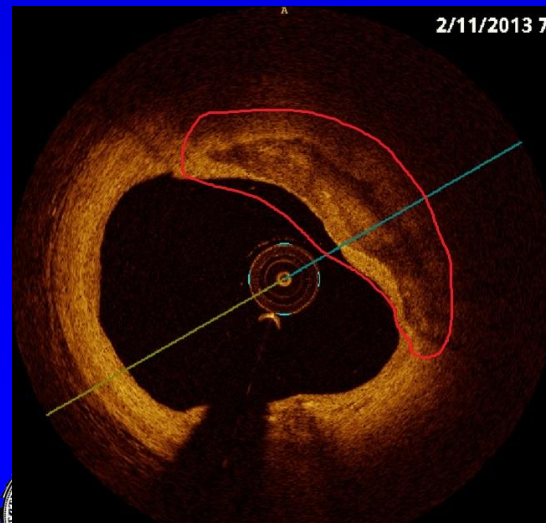
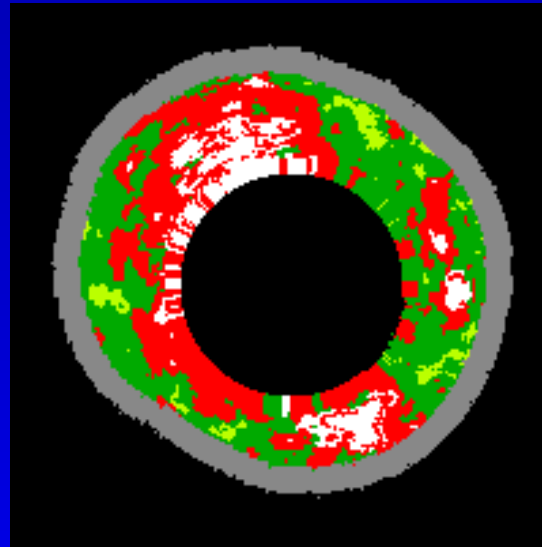
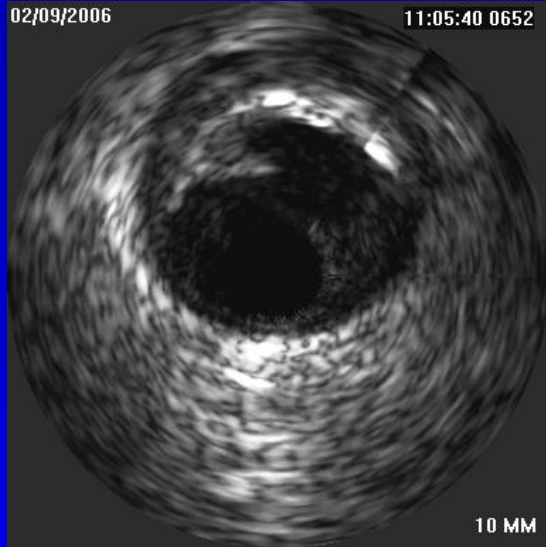
Albert Einstein



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Morfologické metody: IVUS, IVUS-VH, OCT, NIRS



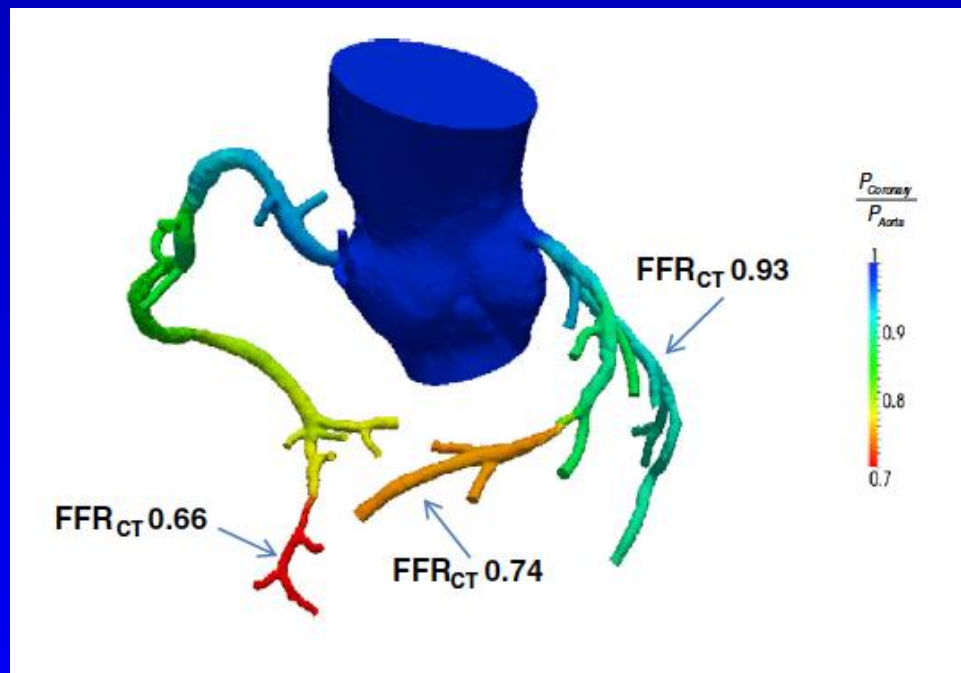
Evropská doporučení pro revaskularizaci myoardu

Recommendations for the clinical value of intracoronary diagnostic techniques

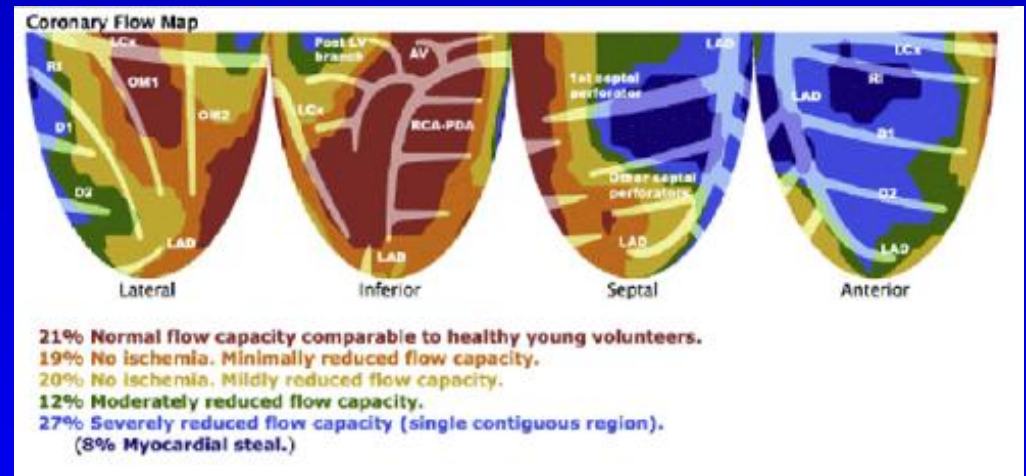
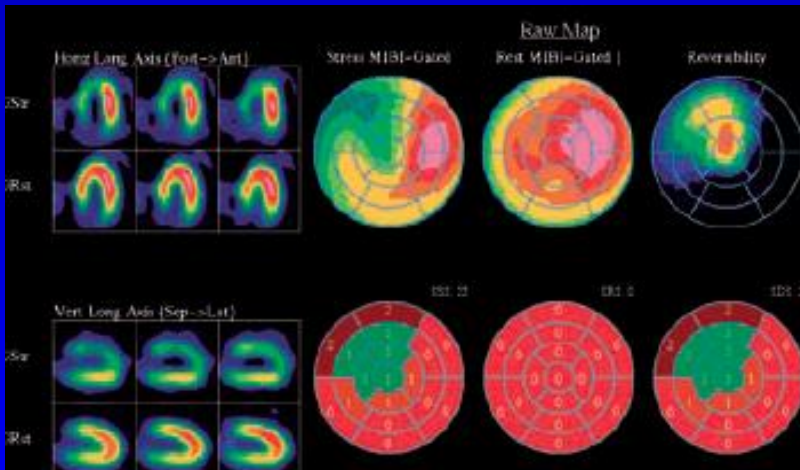
Recommendations	Class ^a	Level ^b	Ref. ^c
FFR to identify haemodynamically relevant coronary lesion(s) in stable patients when evidence of ischaemia is not available.	I	A	50,51,713
FFR-guided PCI in patients with multivessel disease.	IIa	B	54
IVUS in selected patients to optimize stent implantation.	IIa	B	702,703,706
IVUS to assess severity and optimize treatment of unprotected left main lesions.	IIa	B	705
IVUS or OCT to assess mechanisms of stent failure.	IIa	C	
OCT in selected patients to optimize stent implantation.	IIb	C	



Neinvazivní zobrazení koronárních tepen CT angiografie a CT FFR



Zobrazení perfúze myokardu SPECT, PET



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Vliv koronární perfúze vs. angiografického hodnocení stenóz na prognózu

Table 2. Association Between Coronary Flow Reserve, Luminal Angiographic Severity, and Clinical Events

Outcome	Univariable Model Hazard Ratio (95% CI)		Multivariable Model* Hazard Ratio (95% CI)	
	CFR†	CADPI‡	CFR†	CADPI‡
Cardiovascular death or heart failure§	2.17 (1.34–3.52)	1.10 (0.99–1.21)	2.02 (1.20–3.40)	1.17 (1.01–1.34)
All-cause death or heart failure§	1.91 (1.29–2.83)	1.05 (0.97–1.15)	1.64 (1.08–2.48)	1.15 (1.03–1.29)
Cardiovascular death, heart failure,§ or myocardial infarction¶	1.90 (1.23–2.93)	1.13 (1.03–1.24)	1.63 (1.02–2.59)	1.22 (1.08–1.38)



Závěr

- Zobrazovací metody dnes schopny detailně popsat morfologii i funkční dopad koronárních stenóz.
- V současnosti je akcent na indikace koronárních intervencí podle funkční významnosti lézí.
- Rychle se rozvíjí neinvazivní diagnostika ischemie.
- Při vší technické dokonalosti je třeba nezapomínat, že srdce je sídlem duše.



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